

## Exhibit A

### SCOPE OF WORK

#### TECHNICAL TASK LIST

Task #	CPR	Task Name
1	N/A	Administration
2		Smart Grid Projects Database and Website
3		Track Smart Grid Projects and Update Database
4		Smart Grid Projects Assessment
5		Develop Conclusions and Recommendations

#### KEY NAME LIST

Task #	Key Personnel	Key Subcontractor(s)
1	UC Berkeley/Jeff Wright CIEE/Gaymond Yee	
2	UC Berkeley/Jeff Wright CIEE/Gaymond Yee	LBNL
3	UC Berkeley/Jeff Wright CIEE/Gaymond Yee	LBNL
4	UC Berkeley/Jeff Wright CIEE/Gaymond Yee	LBNL
5	UC Berkeley/Jeff Wright CIEE/Gaymond Yee	LBNL

#### GLOSSARY

*Specific terms and acronyms used throughout this work statement are defined as follows:*

Acronym	Definition
ARRA	American Recovery and Reinvestment Act of 2009
CSUS	California State University Sacramento
DOE	United States Department of Energy
DE-FOA	Department of Energy Funding Opportunity Announcement
CCM	Energy Commission Contract Manager
CIEE	California Institute for Energy and Environment
CPR	Critical Project Review
Energy Commission	California Energy Commission
LBNL	Lawrence Berkeley National Laboratory

Acronym	Definition
PIER	Public Interest Energy Research
SGD	Smart Grid Demonstration
SGIG	Smart Grid Investment Grant
SQL	Structured Query Language

## Problem Statement

Under the United States Federal Government American Recovery and Reinvestment Act of 2009 (ARRA), the United States Department of Energy (DOE) is funding Smart Grid research across the country. The Smart Grid Investment Grant (SGIG) Program (DE-FOA-0000058) is accelerating the transformation of electric transmission and distribution systems by promoting investments in smarter grid technologies, tools, and techniques for immediate commercial use. The goals of the program involve accelerating progress toward a grid that:

- Enables informed participation by consumers in retail and wholesale electricity markets
- Accommodates all types of central and distributed electric generation and storage options
- Enables new products, services, and markets
- Provides for power quality for a range of needs by all types of consumers
- Optimizes asset utilization and operating efficiency of the electric power system
- Anticipates and responds to system disturbances
- Operates resiliently during attacks and natural disasters

In addition, the Smart Grid Demonstration (SGD) Program (DE-FOA-0000036) is composed of regional demonstration projects and utility-scale energy storage projects.

In the regional studies, project teams verify Smart Grid technology viability, quantify costs and benefits, and validate new business models that can later be adapted and replicated around the country. The goal of these projects is to provide the information necessary to enable customers, electricity distributors, and electricity generators to change their behavior to reduce electric power system demands and costs, increase energy efficiency, match electricity demand and resources, and increase the reliability of the grid.

In the energy storage projects, teams are working toward advancements in grid-scale energy storage. Electric power system operators can use electricity storage devices to manage the amount of power required to supply customers at times when the need is greatest, which is during peak load. In addition, energy storage devices can:

- Make renewable energy resources, whose power output cannot be controlled by grid operators, more manageable
- Balance microgrids to achieve a good match between generation and load
- Provide frequency regulation to maintain the balance between the network's load and power generated
- Enable deferment of transmission and distribution investments
- Provide a more reliable power supply for high-tech industrial facilities

The DOE has awarded or will be awarding dozens of ARRA SGD and SGIG projects. These projects will be conducted by a multitude of private companies, research organizations, higher education institutions, and electric utilities in numerous states across the country. There is a need to develop a methodology to track the progress and access the results of the projects to better understand the effectiveness and impact of the projects from the perspective of the potential benefits to California.

Additionally, the State of California (as well as the nation) will benefit if there is more immediate and better dissemination of the project progress and results to researchers, regulators, legislators, and the general public in California.

### **Goals of the Agreement**

The goals of this Agreement are to develop new research tools to disaggregate the information and results from the ARRA projects (including specific technologies being deployed), measure the gaps that exist in the overall research agenda of the ARRA projects, and determine deficiencies in California's plans for implementation of the Smart Grid over the next decade.

The issues to understand or questions to ask include:

- Are there projects that are related and are there projects that are redundant?
- What are the potential benefits and costs to California of the new technologies being introduced or demonstrated?
- What is the potential for California workforce development?
- What are the barriers to the adoption potential of the new technologies?
- What are the key issues with regard to standards, interoperability, security, and privacy?
- How do the new technologies integrate with existing California utility systems?
- Are there benefits to California for additional research to fill smart grid research gaps?
- What projects are being conducted outside of California that are beneficial to California's energy and environmental policy goals? What are the best practices that could be learned and transferred from those projects?
- What additional research should be proposed that will help California achieve its energy and environmental policy goals?

### **Objectives of the Agreement**

The objective of this Agreement is to track the progress and assess the DOE ARRA SGD and SGIG Projects. The project is organized into two phases. Phase 1 will focus exclusively on California and Phase 2 will focus on the rest of the country.

This work statement describes Phase 1.

For Phase 1, the specific objectives are:

- Establish a set of metrics to measure the progress, success, and impact of the various California ARRA Smart Grid projects
- Begin development of a publicly accessible user-friendly website and database that categorize smart grid project metrics and parameters
- Develop and deploy a methodology to track the progress of the smart grid projects and continually update the database

- Assess the smart grid projects for technological and interoperability issues
- Estimate the societal benefits of the smart grid technologies
- Develop conclusions and recommendations to the Commission that will accelerate and enhance smart grid efforts in California and help achieve the State's energy and environmental policies

## **TASK 1.0 ADMINISTRATION**

### **MEETINGS**

#### **Task 1.1 Attend Kick-off Meeting**

The goal of this task is to establish the lines of communication and procedures for implementing this Agreement.

##### **The Contractor shall:**

- Attend a "kick-off" meeting with the California Energy Commission (Energy Commission) Contract Manager, the Contracts Officer, and a representative of the Accounting Office. The Contractor shall bring their Project Manager, Contracts Administrator, Accounting Officer, and others designated by the Energy Commission Contract Manager to this meeting. The administrative and technical aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the Energy Commission Contract Manager will provide an agenda to all potential meeting participants.

The administrative portion of the meeting shall include, but not be limited to, the following:

- Terms and conditions of the Agreement
- CPRs (Task 1.2)
- Match fund documentation (Task 1.7)
- Permit documentation (Task 1.8)

The technical portion of the meeting shall include, but not be limited to, the following:

- The Energy Commission Contract Manager's expectations for accomplishing tasks described in the Scope of Work;
- An updated Schedule of Deliverables
- Progress Reports (Task 1.4)
- Technical Deliverables (Task 1.5)
- Final Report (Task 1.6)

The Energy Commission Contract Manager shall designate the date and location of this meeting.

##### **Contractor Deliverables:**

- An Updated Schedule of Deliverables
- An Updated List of Match Funds
- An Updated List of Permits

##### **Energy Commission Contract Manager Deliverables:**

- Final Report Instructions

## **Task 1.2 CPR Meetings**

The goal of this task is to determine if the project should continue to receive Energy Commission funding to complete this Agreement and if it should, are there any modifications that need to be made to the tasks, deliverables, schedule or budget.

CPRs provide the opportunity for frank discussions between the Energy Commission and the Contractor. CPRs generally take place at key, predetermined points in the Agreement, as determined by the Energy Commission Contract Manager and as shown in the Technical Task List above and in the Schedule of Deliverables. However, the Energy Commission Contract Manager may schedule additional CPRs as necessary, and, if necessary, the budget will be reallocated to cover the additional costs borne by the Contractor, but the overall contract amount will not increase.

Participants include the Energy Commission Contract Manager (CCM) and the Contractor, and may include the Commission Contracts Officer, the PIER Program Team Lead, other Energy Commission staff and Management as well as other individuals selected by the Energy Commission Contract Manager to provide support to the Energy Commission.

### **The Energy Commission Contract Manager shall:**

- Determine the location, date and time of each CPR meeting with the Contractor. These meetings generally take place at the Energy Commission, but they may take place at another location.
- Send the Contractor the agenda and a list of expected participants in advance of each CPR. If applicable, the agenda shall include a discussion on both match funding and permits.
- Conduct and make a record of each CPR meeting. One of the outcomes of this meeting will be a schedule for providing the written determination described below.
- Determine whether to continue the project, and if continuing, whether or not to modify the tasks, schedule, deliverables and budget for the remainder of the Agreement, including not proceeding with one or more tasks. If the Energy Commission Contract Manager concludes that the project needs a formal amendment or that satisfactory progress is not being made and the project needs to be ended, these conclusions will be referred to the Commission's Research, Development and Demonstration Policy Committee for its concurrence.
- Provide the Contractor with a written determination in accordance with the schedule. The written response may include a requirement for the Contractor to revise one or more deliverable(s) that were included in the CPR.

### **The Contractor shall:**

- Prepare a CPR Report for each CPR that discusses the progress of the Agreement toward achieving its goals and objectives. This report shall include recommendations and conclusions regarding continued work of the projects. This report shall be submitted along with any other deliverables identified in this Scope of Work. Submit these documents to the Energy Commission Contract Manager and any other designated reviewers at least 15 working days in advance of each CPR meeting.
- Present the required information at each CPR meeting and participate in a discussion about the Agreement.

**Contractor Deliverables:**

- CPR Report(s)
- CPR deliverables identified in the Scope of Work

**Energy Commission Contract Manager Deliverables:**

- Agenda and a List of Expected Participants
- Schedule for Written Determination
- Written Determination

**Task 1.3 Final Meeting**

The goal of this task is to closeout this Agreement.

**The Contractor shall:**

- Meet with the Energy Commission to present the findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement.

This meeting will be attended by, at a minimum, the Contractor, the Commission Contracts Officer, and the Energy Commission Contract Manager. The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be two separate meetings at the discretion of the Energy Commission Contract Manager.

The technical portion of the meeting shall present findings, conclusions, and recommended next steps (if any) for the Agreement. The Energy Commission Contract Manager will determine the appropriate meeting participants.

The administrative portion of the meeting shall be a discussion with the Energy Commission Contract Manager and the Contracts Officer about the following Agreement closeout items:

- What to do with any state-owned equipment (Options)
  - Need to file UCC.1 form re: Energy Commission's interest in patented technology
  - Energy Commission's request for specific "generated" data (not already provided in Agreement deliverables)
  - Need to document Contractor's disclosure of "subject inventions" developed under the Agreement
  - "Surviving" Agreement provisions, such as repayment provisions and confidential deliverables
  - Final invoicing and release of retention
- Prepare a schedule for completing the closeout activities for this Agreement.

**Deliverables:**

- Written documentation of meeting agreements and all pertinent information
- Schedule for completing closeout activities

## **REPORTING**

**See Exhibit D, Reports/Deliverables/Records.**

### **Task 1.4 Quarterly Progress Reports**

The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the research objectives of this Agreement.

**The Contractor shall:**

- Prepare progress reports which summarize all Agreement activities conducted by the Contractor for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Each progress report is due to the Energy Commission Contract Manager within 10 working days after the end of the reporting period. Attachment A-2, Progress Report Format, provides the recommended specifications.

**Deliverables:**

- Quarterly Progress Reports

### **Task 1.5 Test Plans, Technical Reports and Interim Deliverables**

The goal of this task is to set forth the general requirements for submitting test plans, technical reports and other interim deliverables, unless described differently in the Technical Tasks. When creating these deliverables, the Contractor shall use and follow, unless otherwise instructed in writing by the Energy Commission Contract Manager, the latest version of the PIER Style Manual published on the Energy Commission's web site:

<http://www.energy.ca.gov/contracts/pier/contractors/index.html>

**The Contractor shall:**

- Unless otherwise directed in this Scope of Work, submit a draft of each deliverable listed in the Technical Tasks to the Energy Commission Contract Manager for review and comment in accordance with the approved Schedule of Deliverables. The Energy Commission Contract Manager will provide written comments back to the Contractor on the draft deliverable within 10 working days of receipt. Once agreement has been reached on the draft, the Contractor shall submit the final deliverable to the Energy Commission Contract Manager. The Energy Commission Contract Manager shall provide written approval of the final deliverable within 5 working days of receipt. Key elements from this deliverable shall be included in the Final Report for this project.

### **Task 1.6 Final Report**

The goal of this task is to prepare a comprehensive written Final Report that describes the original purpose, approach, results and conclusions of the work done under this Agreement. The Energy Commission Contract Manager will review and approve the Final Report. The Final Report must be completed on or before the termination date of the Agreement. When creating these deliverables, the Contractor shall use and follow, unless otherwise instructed in writing by the Energy Commission Contract Manager, the latest version of the PIER Style Manual published on the Energy Commission's web site:

<http://www.energy.ca.gov/contracts/pier/contractors/index.html>

The Final Report shall be a public document. If the Contractor has obtained confidential status from the Energy Commission and will be preparing a confidential version of the Final Report as well, the Contractor shall perform the following subtasks for both the public and confidential versions of the Final Report.

The final report will be a document that will summarize and integrate the results of the different technical studies described and listed in the “Technical Tasks” section of this Interagency Agreement.

#### **Task 1.6.1 Final Report Outline**

##### **The Contractor shall:**

- Prepare a draft outline of the Final Report.
- Submit the draft outline of Final Report to the Energy Commission Contract Manager for review and approval. The Energy Commission Contract Manager will provide written comments back to the Contractor on the draft outline within 10 working days of receipt. Once agreement has been reached on the draft, the Contractor shall submit the final outline to the Energy Commission Contract Manager. The Energy Commission Contract Manager shall provide written approval of the final outline within 5 working days of receipt.

##### **Deliverables:**

- Draft Outline of the Final Report
- Final Outline of the Final Report

#### **Task 1.6.2 Final Report**

##### **The Contractor shall:**

- Prepare the draft Final Report for this Agreement in accordance with the approved outline.
- Submit the draft Final Report to the Energy Commission Contract Manager for review and comment. The Energy Commission Contract Manager will provide written comments within 10 working days of receipt.  
Once agreement on the draft Final Report has been reached, the Energy Commission Contract Manager shall forward the electronic version of this report for Energy Commission internal approval. Once the approval is given, the Energy Commission Contract Manager shall provide written approval to the Contractor within 5 working days.
- Submit one bound copy of the Final Report with the final invoice.

##### **Deliverables:**

- Draft Final Report
- Final Report

#### **MATCH FUNDS, PERMITS, AND ELECTRONIC FILE FORMAT**

##### **Task 1.7 Identify and Obtain Matching Funds**

The goal of this task is to ensure that the match funds planned for this Agreement are obtained for and applied to this Agreement during the term of this Agreement.

The costs to obtain and document match fund commitments are not reimbursable through this Agreement. While the PIER budget for this task will be zero dollars, the Contractor may utilize match funds for this task. Match funds shall be spent concurrently or in advance of PIER funds during the term of this Agreement. Match funds must be identified in writing, and the associated commitments obtained before the Contractor can incur any costs for which the Contractor will request reimbursement.

**The Contractor shall:**

- Prepare a letter documenting the match funding committed to this Agreement and submit it to the Energy Commission Contract Manager at least 2 working days prior to the kick-off meeting:
  1. If no match funds were part of the proposal that led to the Energy Commission awarding this Agreement and none have been identified at the time this Agreement starts, then state such in the letter.
  2. If match funds were a part of the proposal that led to the Energy Commission awarding this Agreement, then provide in the letter:
    - A list of the match funds that identifies the:
      - Amount of each cash match fund, its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied.
      - Amount of each in-kind contribution, a description, documented market or book value, and its source, including a contact name, address and telephone number and the task(s) to which the match funds will be applied. If the in-kind contribution is equipment or other tangible or real property, the Contractor shall identify its owner and provide a contact name, address and telephone number, and the address where the property is located.
    - A copy of the letter of commitment from an authorized representative of each source of cash match funding or in-kind contributions that these funds or contributions have been secured.
- Discuss match funds and the implications to the Agreement if they are significantly reduced or not obtained as committed, at the kick-off meeting. If applicable, match funds will be included as a line item in the progress reports and will be a topic at CPR meetings.
- Provide the appropriate information to the Energy Commission Contract Manager if during the course of the Agreement additional match funds are received.
- Notify the Energy Commission Contract Manager within 10 working days if during the course of the Agreement existing match funds are reduced. Reduction in match funds may trigger an additional CPR.

**Deliverables:**

- A letter regarding Match Funds or stating that no Match Funds are provided
- Letter(s) for New Match Funds
- A copy of each Match Fund commitment letter
- Letter that Match Funds were Reduced (if applicable)

## **Task 1.8 Identify and Obtain Required Permits**

The goal of this task is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track.

Permit costs and the expenses associated with obtaining permits are reimbursable under this Agreement. Permits must be identified in writing before the Contractor can incur any costs related to the use of the permit(s) for which the Contractor will request reimbursement.

### **The Contractor shall:**

- Prepare a letter documenting the permits required to conduct this Agreement and submit it to the Energy Commission Contract Manager at least 2 working days prior to the kick-off meeting:
  1. If there are no permits required at the start of this Agreement, then state such in the letter.
  2. If it is known at the beginning of the Agreement that permits will be required during the course of the Agreement, provide in the letter:
    - A list of the permits that identifies the:
      - Type of permit
      - Name, address and telephone number of the permitting jurisdictions or lead agencies
    - Schedule the Contractor will follow in applying for and obtaining these permits.
- The list of permits and the schedule for obtaining them will be discussed at the kick-off meeting, and a timetable for submitting the updated list, schedule and the copies of the permits will be developed. The implications to the Agreement if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in the progress reports and will be a topic at CPR meetings.
- If during the course of the Agreement additional permits become necessary, then provide the appropriate information on each permit and an updated schedule to the Energy Commission Contract Manager.
- As permits are obtained, send a copy of each approved permit to the Energy Commission Contract Manager.
- If during the course of the Agreement permits are not obtained on time or are denied, notify the Energy Commission Contract Manager within 5 working days. Either of these events may trigger an additional CPR.

### **Deliverables:**

- A letter documenting the Permits or stating that no Permits are required
- Updated list of Permits as they change during the Term of the Agreement
- Updated schedule for acquiring Permits as it changes during the Term of the Agreement
- A copy of each approved Permit

## **Task 1.9 Electronic File Format**

The goal of this task is to unify the formats of electronic data and documents provided to the Energy Commission as contract deliverables. Another goal is to establish the computer platforms, operating systems and software that will be required to review and approve all software deliverables.

### **The Contractor shall:**

- Deliver documents to the Energy Commission Contract Manager in the following formats:
  - Data sets shall be in Microsoft (MS) Access or MS Excel file format.
  - PC-based text documents shall be in MS Word file format.
  - Documents intended for public distribution shall be in PDF file format, with the native file format provided as well.
  - Project management documents shall be in MS Project file format.
- Request exemptions to the electronic file format in writing at least 90 days before the deliverable is submitted.

### **Deliverables:**

- A letter requesting exemption from the Electronic File Format (if applicable)

## **TECHNICAL TASKS**

The Contractor shall prepare all deliverables in accordance with the requirements in Task 1.5. Deliverables not requiring a draft version are indicated by marking “(no draft)” after the deliverable name.

## **Task 2 Smart Grid Projects Database and Website**

The purposes of this task are to (1) perform the research to develop and implement a methodology to acquire information about the DOE ARRA Smart Grid projects being conducted in California, and (2) design and develop a database and web site that will make the results from this project available to the public. The design of the database must be extensible and support flexible queries. It will use a relational database management system such as the commercial Structured Query Language (SQL) Server from Microsoft or the open source MySQL.

The website will eventually be made available to the public for accessing the smart grid projects database. The design of the web site is to be as user-friendly as possible and will allow an ordinary citizen to quickly find information regarding the smart grid projects.

Initially, the website will be implemented as pages on the i<sup>4</sup>Energy Center web site. The URL is <http://i4energy.org>. During development, the web site will only be accessible by people working on the project and by staff at the Energy Commission. In the completion of this task, the web pages and database will be transferred to the Energy Commission web server for public access. However, if the transfer is not possible due to technical or security constraints from the Energy Commission's information technology department, then the Contractor shall acquire a unique domain name and the web site will be publicly accessible under its own domain name. A link to the web site can then be placed on the Energy Commission's web site.

**The Contractor shall:**

- Acquire the list and current status of the California projects in the DOE ARRA Smart Grid Demonstration Program and the Smart Grid Investment Grant Program.
- Determine which projects have been funded, which projects have started, and the estimated start dates for those projects that are still in the contract negotiation stage.
- Acquire copies of the work statements for those projects that have started.
- Maintain a schedule, based on the estimated start dates, for the acquisition of the remaining work statements.
- Determine which projects have special relevance to PIER research, development and demonstration, including work that would lead to new Title 20 and Title 24 projects, load management and communications standards, distribution automation, penetration and intermittency of renewables, and other potential impacts on California's utilities grid.
- Prepare a list of Smart Grid projects and their current status.
- Design, develop, and implement the database that will be used to store the smart grid projects parameters that will be collected in this project.
- Develop and prepare a database design document showing schema of the database and sample queries.
- Identify sample web sites with designs that potentially meet the needs of this project.
- Present and discuss these web sites and their features with the Energy Commission.
- Prepare design of the web site consisting of mocked web pages and sample database queries.
- Design and develop the web site.
- Test and demonstrate the web site, using actual data and test data.
- Prepare a web site design document with screen shots of web pages.

**Deliverables:**

- List of Smart Grid projects (no draft)
- Database design document (no draft)
- Web site design document (no draft)

**Task 3 Track Smart Grid Projects and Update Database**

The purpose of this task is to track the progress of California smart grid projects, categorize the results of that tracking, and update the database with new results. In coordination with the California State University Sacramento Smart Grid Center, progress will be tracked by acquiring and reviewing project reports from grantees and DOE, interviewing key personnel from a selection of the smart grid grantees' project teams in person and by telephone, and attending DOE sponsored workshops related to ARRA Smart Grid projects.

The projects will be categorized by whether completed projects met the goals of the original grant, whether in-progress projects are on-track to meet their respective goals, how relevant the projects are to utility operations, lessons learned as stated by grantees relative to subjects such as technology, processes, integration, and skills, and the grantees' conclusions and recommendations.

As early as possible in the project, a workshop will be held to communicate the basics of Smart Grid architectures and to assess utilities' concerns within local and regional utilities communities. The information gathered will be used to make the smart grid database developed in this research more relevant and useful.

**The Contractor shall:**

- Track the progress of the smart grid projects by reviewing project reports, interviewing key personnel, and attending DOE-sponsored workshops related to ARRA Smart Grid projects.
- Categorize projects by whether goals were met, whether projects are on-track, relevancy of projects to California utilities (i.e., demand response, distribution automation, distributed generation and storage, penetration and intermittency of renewables), lessons learned, and conclusions and recommendations of grantees.
- Conduct an ARRA Smart Grid workshop to share intermediate results of the research and ascertain utilities' concerns about the smart grid and the database.
- Prepare an ARRA Smart Grid Workshop summary that shall include a summary of each workshop presentation, slide decks from the regional workshop presenters and the attendance list.
- Update the smart grid database with newly acquired information and newly developed results.
- Prepare a Web site Update Report with screen shots of the web site. The report will document new categories of project related data.
- Access and check the new information on the web site to ensure the web site and database are operating properly.

**Deliverables:**

- ARRA Smart Grid Workshop summary (no draft)
- Web site update report (no draft)

**Task 4 Smart Grid Projects Assessment**

The purposes of this task are to develop a set of metrics and parameters to track and categorize smart grid projects, and to assess the relevance of the California projects with respect to the list. The list will include project interrelationships, technology and interoperability issues, and estimates of potential societal benefits.

The metrics and parameters will be used to track and categorize the research and demonstrations being conducted in the smart grid projects. They should lead to answers to questions such as where distributed energy resources are being deployed, how will they impact the grid, and how their results will affect distribution, communications, and control. The Contractor shall use the DOE "Guidebook for ARRA Smart Grid Program Metrics and Benefits" (December 7, 2009) as a starting point.

The project will determine the smart grid project's interrelationships both within the utility and between utilities, in order to identify projects that augment other projects, projects that are redundant with duplicate efforts, and projects that involve integration with existing or new utility systems.

The project will determine the technological and interoperability issues encountered in the smart grid projects. Issues to be investigated include:

- Technology maturity. Categorize the maturity of the technologies as follows: barely functional, in need of refinement, ready for the market, and already a commercial product.
- Technology adoption. Determine technologies that were successfully adopted as well as technologies that were not adopted and the barriers that prevented the adoption.
- Technology integration. Successful or unsuccessful integration of smart grid technologies with other new or legacy systems.
- Non-proprietary/proprietary systems. Technologies that were non-proprietary or proprietary and their effects on the adoption of the technologies.
- Gaps in areas such as technology, standards, and security. Technologies, standards, and security that were neither implemented nor demonstrated in the smart grid projects.
- Privacy implications as a result of the implemented technology.

The project shall estimate the potential societal benefits of the technologies implemented or demonstrated in the smart grid projects. This will include workforce development and training.

- Identify potential benefits to California ratepayers associated with implementations of technologies developed or demonstrated in the smart grid projects. Estimate qualitatively the benefits based on evaluation of factors such as:
  - Supporting smart grid operations (e.g., automation, distributed generation and storage, communications, demand response, costs)
  - Other smart grid sub-systems
  - Reduction in peak demand
  - Increased availability and reliability
  - Improved system efficiency and asset utilization
  - Improved load factor
  - Improved ability to integrate electricity capacity from distributed and renewable energy sources
- Identify potential impacts to workforce development in California associated with the development and implementation of smart grid technologies. Estimate qualitatively the impacts by examining factors such as:
  - Direct jobs creation within the utility industry or suppliers to the utilities
  - Jobs from new start-up companies spun out using smart grid technology
  - Indirect jobs creation from better utilization of electricity resources
- Identify potential workforce training requirements based on skills required to integrate new technologies

**The Contractor shall:**

- Develop and prepare a list of metrics and parameters used to track and categorize smart grid projects.
- Assess the relevance of the smart grid projects with respect to the list of metrics and parameters.

- Determine the smart grid project's interrelationships both within the utility and between utilities.
- Determine which technological and interoperability issues involving national Smart Grid standards were encountered in the smart grid projects.
- Identify potential benefits to California ratepayers associated with implementation of technologies developed or demonstrated in the smart grid projects and estimate them qualitatively.
- Identify potential impacts to workforce development in California associated with the development and implementation of smart grid technologies and estimate them qualitatively.
- Identify potential workforce training requirements based on skills required to integrate new technologies.
- Document assessment findings in the Smart Grid Projects Assessment Final Report.

#### **Deliverables:**

- List of metrics and parameters (no draft)
- Assessment findings (to be included in the Smart Grid Projects Assessment Final Report)

#### **Task 5 Develop Conclusions and Recommendations**

Upon completion of the assessment of the California smart grid projects, the project will develop conclusions and recommendations for the Energy Commission's PIER Program.

#### **The Contractor shall:**

- Determine the impact of gaps and other barriers to smart grid technology adoption. Examples may include:
  - Lack of interoperable, standards-based communications equipment.
  - Unavailability of necessary systems integration skills.
  - Inability to integrate new systems with legacy back-office software.
- Determine the applicability of the projects to California's energy policy goals.
  - Determine whether the smart grid projects, in particular the ones in California, are aligned with the national smart grid standardization efforts that are progressing in parallel.
- Integrate findings with other research.
  - Integrate with conclusions from DOE reports and other on-going or prior smart grid projects at Lawrence Berkeley National Laboratory (LBNL), CSUS, EnerNex, and CaRon Energy Strategies.
- Make recommendations to the Energy Commission's PIER Program.
  - Compare findings with high-level goals for smart grid development.
  - Recommend further smart grid research development and demonstration projects to fill smart grid technology gaps and to lower the barriers to adoption of smart grid technologies.
  - Recommend additional funding for smart grid projects that were assessed that further California's smart grid and energy policy goals.

- Prepare a Memorandum on Smart Grid Assessment Project Conclusions and Recommendations.
- Incorporate conclusions and recommendations into a California Smart Grid Projects Assessment Final Report.

**Deliverables:**

- Memorandum on Smart Grid Assessment Project Conclusions and Recommendations (no draft)
- California Smart Grid Projects Assessment Final Report